Computer Networks and ISDN Systems
Volume 28, Issues 7-11, May 1996, Pages 907-920
Proceedings of the Fifth International World Wide Web Conference 6-10 May 1996

doi:10.1016/0169-7552(96)00020-7 Cite or Link Using DOI

Web cache coherence

Adam Dingle[a], and Tomás Partl[b],
[a]KSVI, Charles University, Prague, Czech Republic
[b]FJFI, Czech Technical University, Prague, Czech Republic

Available online 23 November 1999.

Abstract

All Web caches must try to keep cached pages up to date with the master copies of those pages to avoid returning stale pages to users. In traditional distributed systems terminology, the problem of keeping cached pages up to date is called *coherence*. We discuss the coherence problem for Web caches, and argue that coherence techniques used for distributed file system caches may not be satisfactory for Web caches. We survey techniques used by popular Web caches to maintain coherence, including the popular "expiration mechanism" which probably originated in CERN's proxy http server. We discuss a number of problems with the existing expiration mechanism, and present several extensions to it which solve these problems, reduce user wait times and decrease the staleness of returned Web pages. We also discuss *pre-fetching* and *replication*, more speculative techniques for keeping Web caches up to date.

Keywords: Cache; HTTP; Proxy; Coherence

References

Tim Berners-Lee, Propagation, replication and caching on the Web (1995)
(http://www.w3.org/pub/WWW/Propagation/Activity.html).

S. Glassman, A caching relay for the World Wide Web, *Proc. 1st Internat. World Wide Web Conf.* (1994)
(http://www.research.digital.com/SRC/personal/Steve_Glassman/CachingTheWeb/CachingTheWeb.html).

J.H. Howard, M.L. Kazar, S.G. Menees, D.A. Nichols, M. Satyanarayanan, R.N. Sidebotham and M.J. Westl, Scale and performance in a distributed file system, *ACM Trans. Computer Systems* 6 (1988) (1).

Michael L. Kazar, Synchronization and caching issues in the Andrew file system, *USENIX Conf. Proc.* (1988), pp. 27–36.

B. Lyon, G. Sager, J.M. Chang, D. Goldberg, S. Kleiman, T. Lyon, R. Sandberg, D. Walsh and P. Weiss, Overview of the Sun network file system, *Sun Microsystems Tech. Rept.* (January 1985).

Netscape Communications Corporation, Netscape Proxy Server (http://www.netscape.com/comprod/proxy_server.html).

Netscape Communications Corporation, An Exploration of Dynamic Documents (http://home.netscape.com/assist/net_sites/pushpull.html).

Sun Microsystems, *NFS: Network File System Protocol Specification*, RFC 1094.

R. Sandberg, Design and implementation of the Sun network filesystem, *Proc. USENIX 1985 Summer Conf.* (1985).

M. Satyanarayanan *et al.*, Coda: A highly available file system for a distributed workstation environment, *IEEE Trans. Computers* 39 (1990) (4).

Transarc Corporation Transarc Product Information: AFS (http://www.transarc.com:80/afs/transarc.com/public/www/Public/ProdServ/Product/AFS/index.html).

World Wide Web Consortium Hypertext Transfer Protocol (http://www.w3.org/pub/WWW/Protocols/).

World Wide Web Consortium W3C httpd (http://www.w3.org/pub/WWW/Daemon/).

Corresponding author.

Vitae

Adam Dingle earned a B.S.E. in Computer Science from Princeton University in 1990 and a M.S. in Computer Science from the University of California at Berkeley in 1992. Since 1994 he has taught computer science at Charles University in Prague. His interests in computer science include programming languages, distributed systems and networks, especially the Internet. His research presently focuses on distributed caching for the World Wide Web.

Tomáš Pärt was born on May 27, 1974 in Prague. In 1992, he graduated from Southwestern Academy in San Marino, CA. Presently he is a fourth year computer major at the Faculty of Nuclear and Physical Engineering of The Czech Technical University.

Computer Networks and ISDN Systems
Volume 28, Issues 7-11, May 1996, Pages 907-920
Proceedings of the Fifth International World Wide Web Conference 6-10 May 1996